Remarks

A. Summary of Examiner Interview

Applicant thanks Examiner Dudnikov for holding a telephone interview with Applicant (Dr. Philip L. Cole) and his representative Michael C. Barrett on January 18, 2008. During that interview, the arguments and claim amendments of the previous Response were discussed in some detail. Dr. Cole additionally explained concepts of the invention to the Examiner. Applicant proposed additional amendments, similar to those presented in this Submission. Applicant explained how such amendments even further distinguish over the cited art. Examiner Dudnikov stated that he would consider additional arguments and amendments, when they were presented in writing.

B. Status of Application

Claims 1-3, 6, 7, 9, and 28-33 were pending. Claim 1 has been amended. No new matter has been added.

C. Amendment to the Specification

The specification has been amended to correct an inadvertent typographical error.

D. Response to Arguments

Applicant respectfully disagrees with the Office's "Response to Arguments" Section at pages 2-3 of the Action. The Office's characterization of the specification and the invention is incorrect and is, apparently, based on a faulty, personal opinion of the Examiner. Applicant directs the Examiner to the Specification, which describes embodiments of the invention and asks that the Office refrain from unfounded speculation about what the invention is or is not, as well as capabilities of the invention. Applicant notes that the "Response to Arguments" section is not couched as a rejection of any claims and, accordingly, does not feel that a formal response is required. Rather, Applicant addresses the claim rejections below.

E. Section 112

Claims 1-3, 6, 7, 9, and 28-33 stand rejected under Section 112 as allegedly lacking written description. The Office alleges that written description is not satisfied with respect to the following claimed energy range feature (presented in bold in the Office action as follows):

"detecting an emerging photon beam within an energy **range from about 1 MeV to about 50 MeV** from the fissile material with an array of fission-fragment detectors, a first set of scintillator paddles, and a second set of scintillator paddles ... ." Applicant respectfully traverses.

The Office is directed to FIG. 6 of the present specification. That figure shows detection in the range from about 1 MeV to 50 MeV (see horizontal axis). The specification at page 14, lines 6-18 explains that figure, including an explanation of different signals from different detection components. *See* also specification at pages 7-8 (describing a suitable energy range). The paragraph beginning at page 14, line 12, explains how the graph of FIG. 6 is created using signals from physical detectors, such as those claimed herein.

Any argument that the passage cited above requires "continuous" detection or other unclaimed requirements is not supported. The claim language simply recites "detecting" an emerging photon beam "within" a particular energy range. The Specification supports detection within those energy ranges (see page 6 lines 15-19; page 7 lines 16-20; paragraph spanning pages 7-8; page 9 lines 17-19; page 14), as do the Figures (see Figures 1 and 6). Accordingly, there is more than adequate support of the claim language cited here, pursuant to 35 U.S.C. § 112, first paragraph.

Applicant respectfully asserts that the Office has not carried its burden with respect to a written description rejection, especially in light of the explicit support cited above. Applicant respectfully believes this rejection is overcome.

F. Section 103

Claims 1-3, 6, 7, 9, and 28-33 are rejected as being obvious in view of US Patent No. 5,524,133 ("Neale") in view of articles by Gunther and Groom. Applicant respectfully traverses.

Amended claim 1 recites, in part:

> detecting an emerging photon beam within an energy range from about 1 MeV to about 50 MeV from the fissile material with ***an array of fission-fragment detectors, a first set of scintillator paddles, and a second set of scintillator paddles***, wherein the array of fission-fragment detectors, the first set of scintillator paddles, and the

second set of scintillator paddles are ***sensitive to different ranges of photon beam energy***;

obtaining a first signal from the array of fission-fragment detectors, a second signal from the first set of scintillator paddles, and a third signal from the second set of scintillator paddles, ***each signal indicative of photon yield within the different ranges of photon beam energy***; and

determining a photon energy regime of the emerging photon beam through identification of a drop in photon yield in at least one of the three signals, the determined photon energy regime identifying the fissile material.

Such features are nowhere disclosed or suggested by the cited art, alone or in combination. Claim 1 was previously amended to incorporate concepts from now-canceled claim 8 involving data analysis. Claim 1 was also previously amended to recite the determination of a photon energy regime through identification of a drop in photon yield, which is supported in the specification at least at page 8, lines 7-10 and page 14, lines 14-17. For further, non-limiting explanation about the claimed signals and data analysis, please see the specification at page 14, along with Figure 6.

Amended claim 1 now also recites, in part, that the method identifies fissile material "within an interrogated vessel." Amended claim 1 now also recites that the array of fission-fragment detectors, the first set of scintillator paddles, and the second set of scintillator paddles ***are arranged sequentially in a direct path of the emerging photon beam such that each receives the emerging photon beam***. These features too overcome the current rejections.

1. Neale does not disclose or suggest features of the claims.

Neale is directed to a method and apparatus for detecting the mean atomic number of a mass of material by subjecting the material to two groups of X-rays: lower-energy X-rays and higher-energy X-rays. *See* Abstract. Neale defines the mean number of lower-energy X-rays transmitted through the material as N_A and the mean number of the higher-energy X-rays transmitted through the material as N_B. *See* Abstract; column 2, lines 5-23. Neale then computes the ratio of N_A/N_B and uses a lookup table to find the average atomic number of the material, based on the ratio. *See* Abstract; column 2, lines 5-23.

Neale does not disclose or suggest the use of the three distinct, claimed detection components of amended claim 1: (1) an array of fission-fragment detectors, (2) a first set of scintillator paddles, and (3) a second set of scintillator paddles. Instead, Neale discusses a completely different detection scheme: Neal describes a thin crystal followed by a low-Z beam hardener followed by a series of high-Z converters that alternate with and are sandwiched by thin crystals. *See* column 3, lines 48-58.

Neale also nowhere discloses or suggests the claimed data analysis techniques of amended claim 1: obtaining separate signals for each of the distinct detection components and determining an energy regime through identification of a drop in photon yield in at least one of those signals so that one can ultimately identify the fissile material. Instead, as discussed above, Neale teaches a completely different technique: Neale describes determining the ratio N_A/N_B (from two X-ray energy groups) and then using a lookup table to correlate to a specific atomic number. *See* Abstract; column 2, lines 5-23.

The Office points to element 22 in Figure 4 of Neale as meeting claim limitations involving the three claimed detection components and the claimed energy ranges. *See* Office Action at page 5. Applicant respectfully points out that this characterization of Neale finds no support and is incorrect. Element 22 of Neale is simply described as a "detector." *See* column 11, line 8. Mentioning a generic detector cannot be found to amount to a disclosure or teaching of the specific and distinct three detection components recited in amended claim 1. Nor does this detector of Neale implicate the specific data analysis techniques recited in amended claim 1.

The Office also characterizes Neale as involving fissile material (*see* Office Action page 5), yet Neale nowhere mentions fissile material (unlike present, amended claim 1). Neale, moreover, nowhere discusses atomic numbers beyond Z=14 (silicon), whereas embodiments of the present application encompassed by the claims are sensitive to Uranium and other high-Z material.

Additionally, nowhere does Neale disclose or suggest an array of fission-fragment detectors, a first set of scintillator paddles, and a second set of scintillator paddles ***arranged sequentially in a direct path of an emerging photon beam such that each receives the emerging photon beam.*** Neale, as describe above, involves a distinct concept altogether, and

moreover, it appears that a beam may stop in a detector of Neale (preventing any sequential detectors from receiving it), through its particular use of heavy leaded crystals.

As described below, the significant legal and factual shortcomings of Neale are not cured by the secondary references cited by the Office and Applicant therefore respectfully submits that the claims are currently in condition for allowance.

2. Gunther does not disclose or suggest features of the claims.

Gunther is cited as teaching or suggesting the inclusion of a PPAD detector into the device of Neale. As implicitly recognized by the Office, Gunther lacks any teaching or suggestion concerning the three detection components and/or the data analysis techniques argued above. Additionally, Gunther does not teach or suggest an array of fission-fragment detectors, a first set of scintillator paddles, and a second set of scintillator paddles arranged sequentially in a direct path of an emerging photon beam such that each receives the emerging photon beam. Accordingly, even through combination with Gunther, Neale still does not include the elements of amended claim 1, which are argued above.

Moreover, combination with Neale would fundamentally change the principle of operation of Neale, meaning obviousness is not established pursuant to MPEP 2143.01. Specifically, as mentioned above, Neale is directed to a technique that takes a ratio involving **two** X-ray energy regimes. A lookup table then correlates that specific ratio to an atomic number. Inclusion of a PPAD would add at least one other variable beyond the two needed to calculate the ratio N_A/N_B taught by Neale and would require a different data analysis technique altogether, nowhere taught or suggested by Neale or Gunter (or Groom, discussed below).

3. Groom does not disclose or suggest features of the claims.

Groom is believed to be cited in an attempt to show that one would have combined the cited references. Groom nowhere discloses or suggests the claim elements argued above. Groom nowhere suggests that one should, or could, utilize the specific detection setup and data analysis techniques presently claimed in amended claim 1, nor does the Office suggest otherwise. Groom's failure to aid in an obviousness position is further highlighted by Neale's clear requirement that **two** X-ray energy regimes be used to form a **ratio** (N_A/N_B) that is then used with a lookup table to determine an atomic number. Thus, even in combination with

Groom and/or Gunther, Neale does not render obvious the specific, claimed technique that uses three detector components along with specific data analysis techniques. Likewise, the references in combination do not render obvious the features concerning the array of fission-fragment detectors, the first set of scintillator paddles, and the second set of scintillator paddles arranged sequentially in a direct path of an emerging photon beam such that each receives the emerging photon beam.

4. Conclusion

Neale, Gunther, and Groom do not disclose, teach, or suggest the features of amended claim 1, alone or in any combination. Further, the combination of these references is not proper, even following the Supreme Court's *KSR* decision. For example, the argued combinations would fundamentally change the operating principles of Neale. State differently, it can be said that Neale *teaches away* from the Office's proposed combinations because those combinations (*e.g.*, adding a PPAD) would destroy or modify Neale's technique of looking up atomic numbers by simply using two calculated values N_A and N_B that are based on interrogation by two different X-ray energy regimes. Any arguments that it would have been obvious to fundamentally change both the detection hardware (Neale does not use the three separate detection components claimed), data analysis techniques (Neale uses a completely different ratio/lookup table analysis), and arrangement of physical components (e.g., to sequentially arrange specific components) to match claim 1 would amount to impermissible hindsight that is not supported by any of the cited references and which does not establish obviousness pursuant to MPEP 2145.

Applicant believes that these remarks fully respond to all outstanding matters for this application. Applicant respectfully requests that the rejections of all claims be withdrawn so the claims may swiftly pass to issuance.

Should the Examiner desire to sustain any of the rejections discussed in this submission, the courtesy of a telephone conference between the Examiner, the Examiner's supervisor, and the undersigned attorney at 512-536-3018 is respectfully requested in advance.

Respectfully submitted,

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